

Two new species and two new subspecies of the Boarmiini from Taiwan, with notes on *Alcis anmashanensis* Sato (Geometridae, Ennominae)

Rikio SATO

2-27-29, Shindori-nishi, Niigata, 950-2036 Japan

Abstract *Ramobia anmashana*, *Psilalcis fui*, *Duliophyle agitata taiwana*, *Cleora leucophaea taiwanensis* are described as new to science from Taiwan. The females of *Alcis anmashanensis* Sato are first recorded with a description.

Key words Boarmiini, Geometridae, new species, new subspecies, Taiwan.

Recently I examined some Boarmiini specimens taken at Mts Anmashan, Taichung Co., in Taiwan, by Messrs C.-M. Fu and H.-R. Tzuoo, and found some interesting species among them. In this paper, I will describe two new species of *Ramobia* Inoue and *Psilalcis* Warren, and two new subspecies of *Duliophyle agitata* (Butler) and *Cleora leucophaea* (Butler) from Taiwan, and describe the female of *Alcis anmashanensis* Sato for the first time.

The following abbreviations are used to indicate the location of the type specimens. NIAES: National Institute of Agro-Environmental Sciences, Tsukuba, Japan. NMNS: National Museum of Natural Science, Taichung, Taiwan. ZFMK: Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany. ZSM: Zoologische Staatssammlung, Munich, Germany.

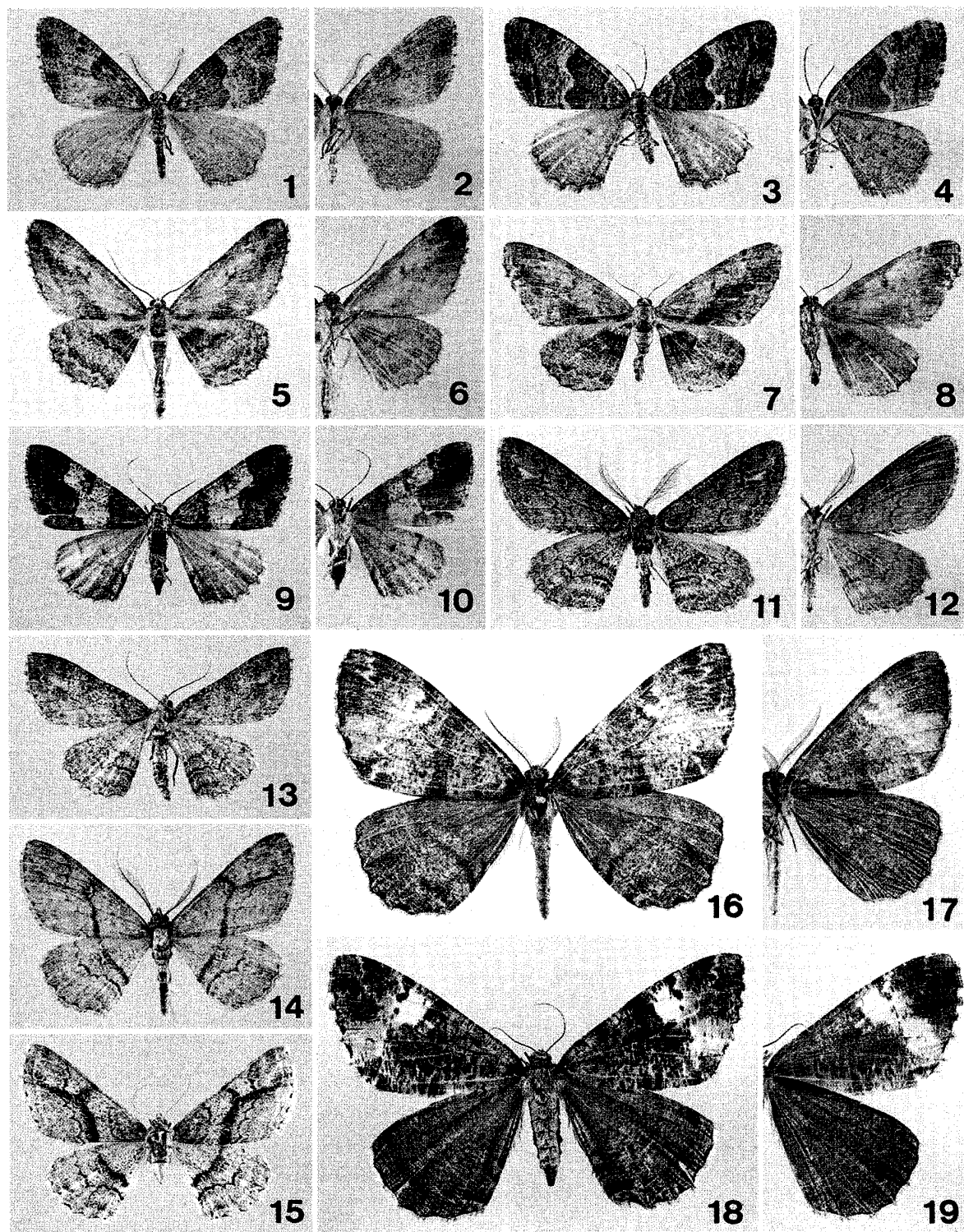
Ramobia anmashana sp. nov. (Figs 1–4)

Similar to *R. basifuscaria* (Leech), but different from it as follows. Smaller in size; length of forewing 18–20 mm, while 20–25 mm in *basifuscaria*. Forewing with basal half more thickly sprinkled with blackish grey strigulae; antemedial line not zigzag, but gradually excurved; medial line more deeply curved; postmedial line less defined. Hindwing paler; postmedial line absent. Underside more densely speckled.

Male genitalia (Fig. 20). Similar to those of *R. mediodivisa* Inoue (Fig. 21), but distinguished from them in the following respects. Uncus shorter, less weakly bilobed at apex; gnathos with medial part less sclerotized, bluntly rounded, not triangular as a whole; valva slenderer, tapering distally, with stouter spines, less in number; juxta more sclerotized medially and apically; aedeagus less scobinate apically; horn-like cornutus shorter. In *R. basifuscaria* (Fig. 22), uncus much larger, not bilobed at apex, medial part of gnathos a large triangle, spinous area of valva more widely developed, horn-like cornutus stouter and longer.

Female genitalia (Fig. 28). Similar to those of *R. mediodivisa* (Fig. 29), but distinguished from them in the following respects. Sterigma with semi-circular part less sclerotized; colliculum almost parallel sided; ductus bursae and corpus bursae slenderer. In *basifuscaria* (Fig. 30), sterigma without semi-circular part, colliculum shorter in length, broadened posteriorly, bursa copulatrix more strongly ribbed and sclerotized.

Holotype. ♂, Taiwan, Taichung Co., Anmashan 2,100 m, 10. xi. 1996 (H.-R. Tzuoo),



Figs 1-4. *Ramobia anmashana* sp. nov. 1-2. ♂. Holotype. 3-4. ♀. Paratype. 5-8. *Psilalcis fui* sp. nov. 5-6. ♂. Holotype. 7-8. ♀. Paratype. 9-10. *Alcis anmashanensis* Sato. ♀. 11-15. *Cleora leucophaea taiwanensis* ssp. nov. 11-12. ♂. Holotype. 13. ♀. Paratype. 14. ♂ (*nigrofasciaria*-form). Paratype. 15. ♀ (*nigrofasciaria*-form). Paratype. 16-19. *Duliophyle agitata taiwana* ssp. nov. 16-17. ♂. Holotype. 18-19. ♀. Paratype.

NMNS. Paratypes. 1 ♂ 2 ♀. 1 ♂, Anmashan 2,100 m, 10. xi. 1996 (C.-M. Fu), RS-5925, NIAES; 1 ♀, *ditto*, NMNS; 1 ♀, *ditto*, RS-5936, NIAES.

Geographical range. Taiwan.

Inoue (1953: 10) erected the genus *Ramobia* to accommodate *Boarmia basifuscaria* Leech, 1891, together with a new species, *R. mediodivisa* Inoue, 1953. Both species were described from Japan, and later *mediodivisa* was recorded from Korea by Shin (1983: 237). The genus *Ramobia* is now recorded from Taiwan for the first time.

The characters of the male and female genitalia show that this species is more closely related to *mediodivisa* than to *basifuscaria*, though in appearance it is more similar to the latter. This species is also similar to the following species described from West China by Wehrli (1943): *Boarmia catachrysa* Wehrli (Tse-kou), *B. diodontata* Wehrli (Tse-kou) and *B. catocirra* Wehrli (Ta-tsien-lou). They have not hitherto been illustrated. I examined the type specimens of them preserved in ZFMK, without dissection of the genitalia. Dr Stüning kindly examined their genitalia for me to confirm the identification of this species. He will write his paper on the genus *Ramobia* from China in the near future.

This new species is an autumn moth like the two known species of *Ramobia*, and may be confined to high altitude above 2,000 m in Taiwan.

***Psilalcis fui* sp. nov.** (Figs 5–8)

Length of forewing 21–22 mm. Forewing elongate in shape; grey irrorated with black, area between medial and subterminal lines suffused with black; lines black; antemedial line gradually excurved, marked at costa, weak or absent elsewhere; medial line almost absent; postmedial line slightly excurved beyond cell, faintly reproduced; subterminal line whitish, irregularly waved; discocellular dot black and small. Hindwing similar to forewing; antemedial and medial lines broadened to form a band. Underside paler than upperside; terminal area of forewing black, leaving a grey rectangular mark at apex; discocellular dots more distinct on both wings. Hindtibia with a hair-pencil and third abdominal sternite with a cluster of spines in male.

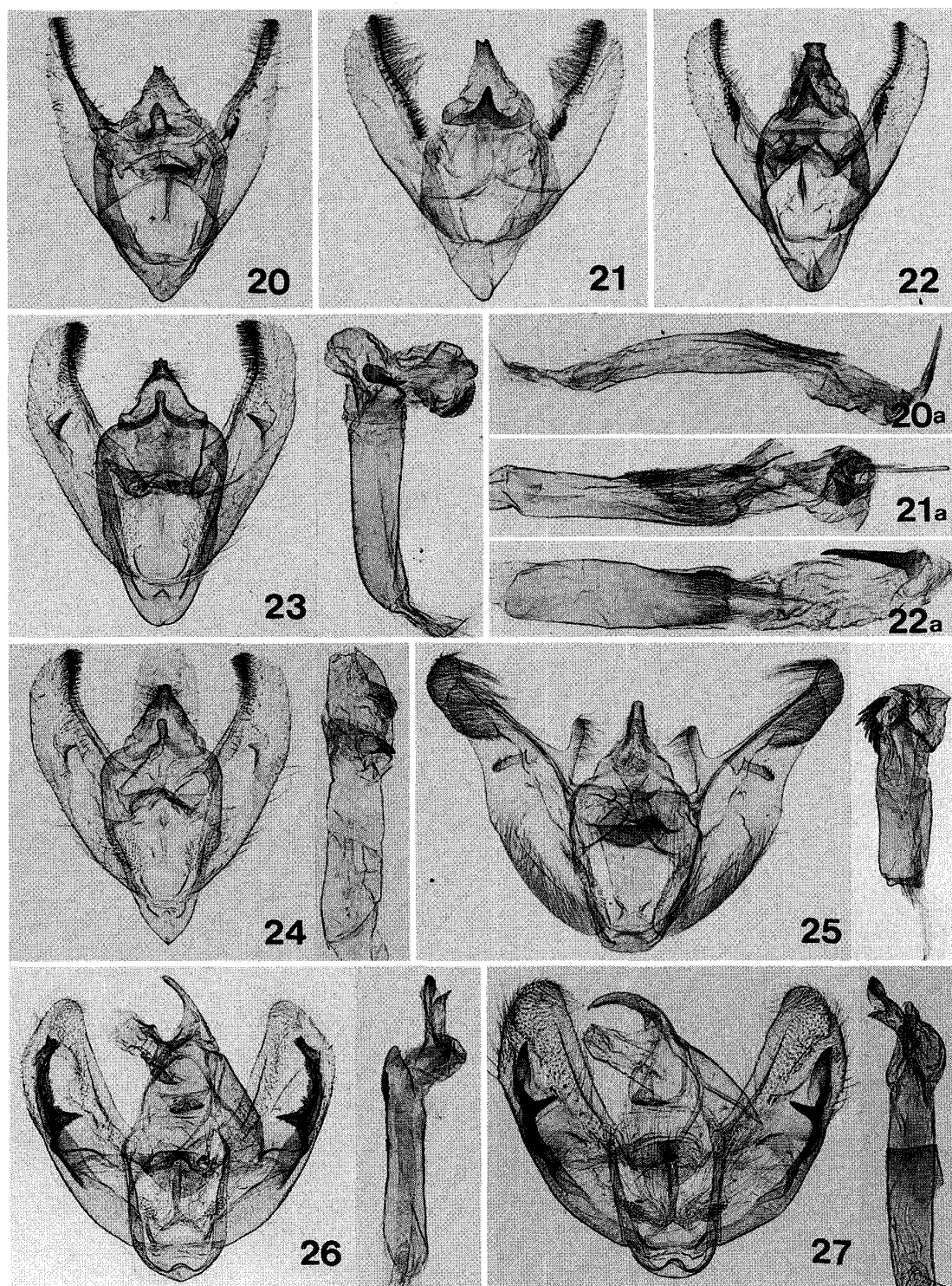
Male genitalia (Fig. 25). Uncus triangular, rounded at apex. Gnathos absent. Valva elongate, ventral margin concave at distal one-third; cucullus well developed, extending beyond ventral margin; costa heavily sclerotized with a long hairy stick-like projection from basal part; ampulla digitate, apical portion with hairs. Juxta weakly sclerotized, broadened posteriorly. Aedeagus sclerotized apically, ending in a wedge-like projection; vesica armed with a row of many stout spines.

Female genitalia (Fig. 31). Sterigma produced medially into a pouch-like shape. Bursa copulatrix with anterior sclerotized and ribbing part about one-sixth of its overall length, slightly swollen posteriorly, bearing two elongate slit-like signa.

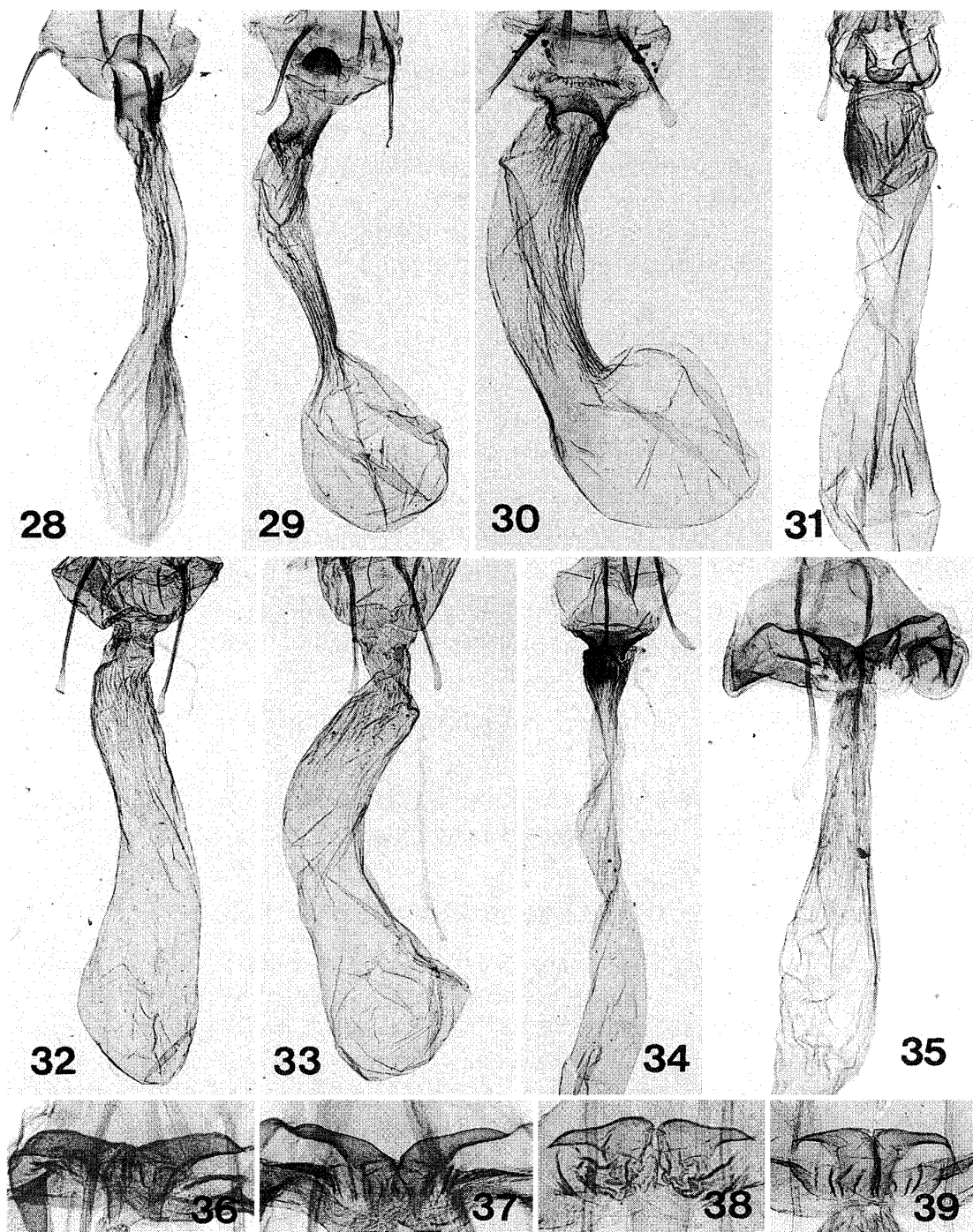
Holotype. ♂, Taiwan, Taichung Co., Anmashan 2,100 m, 9. vii. 1996 (C.-M. Fu), NMNS. Paratypes. 1 ♂ 1 ♀. 1 ♂, Anmashan 2,100 m, 9. vii. 1996 (C.-M. Fu), RS-5927, NIAES; 1 ♀, *ditto*, RS-5937, NMNS.

Geographical range. Taiwan.

Etymology. I take pleasure in naming this species after Mr C.-M. Fu, who collected the type



Figs 20-27. Male genitalia. 20-22. *Ramobia* spp. a: aedeagus. 20. *R. anmashana* sp. nov. RS-5925. 21. *R. mediodivisa* Inoue. Japan, Niigata Pref. RS-5966. 22. *R. basifuscaria* (Leech). Japan, Niigata Pref. RS-5964. 23-24. *Duliophyle agitata* (Butler). 23. *D. a. taiwana* ssp. nov. RS-5933. 24. *D. a. agitata* (Butler). Japan, Niigata Pref. RS-5959. 25. *Psilalcis fui* sp. nov. RS-5927. 26-27. *Cleora leucophaea* (Butler). 26. *C. l. taiwanensis* ssp. nov. RS-5926. 27. *C. l. leucophaea* (Butler). Japan, Niigata Pref. RS-5968.



Figs 28-39. Female genitalia. 28-30. *Ramobia* spp. 28. *R. anmashana* sp. nov. RS-5936. 29. *R. mediodivisa* Inoue. Japan, Niigata Pref. RS-5967. 30. *R. basifuscaria* (Leech). Japan, Niigata Pref. RS-5965. 31. *Psilalcis fui* sp. nov. RS-5937. 32-33. *Duliophyle agitata* (Butler). 32. *D. a. taiwana* ssp. nov. RS-5938. 33. *D. a. agitata* (Butler). Japan, Hokkaido, Hakodate. RS-5961. 34. *Alcis anmashanensis* Sato. RS-5939. 35-39. *Cleora leucophaea* (Butler). 35. *C. l. taiwanensis* ssp. nov. RS-2090. 36-39. Sterigma. 36. *C. l. taiwanensis* ssp. nov. RS-5935. 37. *Ditto*. RS-5946. 38. *C. l. leucophaea* (Butler). Japan, Sado Is. RS-226. 39. *Ditto*. Japan, Yamanashi Pref. RS-5355.

specimens.

The genitalia of both sexes indicate this new species seems to be a member of *Heterarmia* Warren. Holloway (1994) defined the genus *Psilalcis* Warren in a broader sense than me (Sato, 1984), and suggested that the genera *Heterarmia* Warren, *Polymixinia* Wehrli and *Protoarmia* McDunnough would be included in *Psilalcis* by further studies. Therefore I intend to assign this species to *Psilalcis*. In my previous paper on the Boarmiini of Taiwan (Sato, 1999), I proposed new combinations of *P. nigrofasciata* (Wileman), *P. diorthogonia* (Wehrli) and *P. albibasis* (Hampson) for the same reason.

***Duliophyle agitata taiwana* ssp. nov.** (Figs 16–19)

Boarmia agitata Butler, 1878: 396.

Duliophyle agitata: Warren, 1894, *Novit. zool.* 1: 432.

Xandrames (Duliophyle) agitata: Prout, 1915: 381, pl. 23, line a.

Different from the nominotypical subspecies as follows. Larger in size; length of forewing 31–35 mm, while 24–27 mm in the nominotypical subspecies. Forewing with whitish part more developed on both sides.

Male genitalia (Fig. 23). Distinguished from those of the nominotypical subspecies (Fig. 24) as follows. Valva not tapered distally, but truncate; harpe more heavily sclerotized, longer in length; a single thorn-like cornutus longer.

Female genitalia (Fig. 32). No reliable differences from those of the nominotypical subspecies (Fig. 33).

Holotype. ♂, Taiwan, Taichung Co., Anmashan 2,275 m, 30. x. 1996 (C.-M. Fu), RS-5933, NMNS. Paratypes. 2 ♀. 1 ♀, Taiwan, Taichung Co., Anmashan 2,275 m, 13. ix. 1996 (C.-M. Fu), NMNS; 1 ♀, Anmashan 2,100 m, 5. x. 1996 (H.-R. Tzuoo), RS-5938, NIAES.

Geographical range. Taiwan. The nominotypical subspecies: Japan.

Boarmia agitata was described from Japan (Yokohama) by Butler (1878). On the other hand *Xandrames angustaria* was described from West China based on one male (Omei-shan) by Leech (1897: 327), and has been treated as the Chinese subspecies of *agitata* since Prout (1915: 381). According to Dr Stüning's personal information, two species are mixed among the specimens of "*angustaria*" from China in the ZFMK collection. Therefore, the question as to whether *angustaria* should be treated as a distinct species or the Chinese subspecies of *agitata* remains unsolved until the genitalia of the holotype of *angustaria* are examined.

***Cleora leucophaea taiwanensis* ssp. nov.** (Figs 12–15)

Boarmia leucophaea Butler, 1878: 395.

Boarmia (Cleora) leucophaea: Wehrli, 1943: 493, pl. 43, line f.

Cleora leucophaea: Prout, 1930, *Novit. zool.* 35: 329.

Distinguished from the nominotypical subspecies of Japan by more elongate forewing with more oblique termen, and both wings generally paler in colour. Two forms of colour and maculation were recognized in the nominotypical subspecies (Inoue, 1968: 160–161): "*nigrofasciaria*-form" with medial black lines strongly developed on both wings and "*yellow*-form" with yellowish forewing. The former (Figs 14–15) was also found in the Taiwanese population, but the latter has not been taken yet. The nominotypical subspecies was

redescribed in detail including the immature stages by me (Sato, 1984).

Male genitalia (Fig. 26). Harpe formed by a tapered spinous process and a triangular spinous projection. Distal process extending more beyond triangular projection and short spines more developed in number than in the nominotypical subspecies (Fig. 27). Aedeagus more strongly scobinate near apical part.

Female genitalia (Figs 35–37). Easily separable from those of the nominotypical subspecies. Medial part of sterigma more developed, having longer and broader lateral extensions, more deeply concave medially. In the nominotypical subspecies, the shape of sterigma variable individually as shown in Figs 38–39, but the same variation as in the Taiwanese population has not been found.

Holotype. ♂, Taiwan, Taichung Co., Anmashan 2,275 m, 8. iii. 1997 (C.-M. Fu), NMNS. Paratypes. 9 ♂ 7 ♀. 1 ♂, Taiwan, Taichung Co., Anmashan 2,350 m, 9. iii. 1996 (C.-M. Fu), RS-5926, NIAES; 1 ♂, *ditto* 2,275 m, 1. iii. 1997 (C.-M. Fu), RS-5944, NMNS; 1 ♂ (*nigrofasciaria*-form), *ditto* 2,100 m, 28. ii. 1998 (C.-M. Fu), NMNS; 1 ♂ (*nigrofasciaria*-form), *ditto* 2,100 m, 8. iii. 1997 (C.-M. Fu), RS-5945, NIAES; 1 ♀, *ditto* 2,100 m, 15. iii. 1997 (C.-M. Fu), RS-5946, NMNS; 1 ♀, *ditto* 2,100 m, 2. iv. 1997 (C.-M. Fu), RS-5935, NIAES; 1 ♀, *ditto* 2,100 m, 10. ii. 1998 (C.-M. Fu), NMNS; 1 ♀ (*nigrofasciaria*-form), Hualien Co., Tayuling 2,565 m, 27–29. iii. 1981 (K. Kudo), RS-2090, NIAES; 3 ♂, Taoyuan Co., Ming Chyr Forest Recreation Area 1,160 m, 29. ii. 1996 (Gy. Fábrián & L. Néeth), ZSM; 2 ♂ 3 ♀ (1 ♂, *nigrofasciaria*-form), Taoyuan Co., *ditto* 1,100 m, 4. iii. 2000 (H.Y. Wang & W. Speidel), ZFMK.

Geographical range. Taiwan. The nominotypical subspecies: Japan, Korea, Russian Far East (Primorye).

Alcis anmashanensis Sato (Figs 9–10)

Alcis anmashanensis Sato, 1999: 29, fig. 11.

This species was described from Taiwan based on one male taken at Mts Anmashan (alt. 2,350 m) by me (Sato, 1999). I examined the female specimens taken at the type locality by Mr C.-M. Fu. Here I describe the female of *anmashanensis* with the illustration of the genitalia.

Female. Length of forewing 16–18 mm. Almost agrees with male in wing colour and maculation. Similar to *A. tayulina* Sato, 1990, but can be distinguished from it by smaller size, forewing without brownish tint, and antemedial line not approaching postmedial line near inner margin on forewing.

Female genitalia (Fig. 34). Similar to those of *A. ectogramma* (Wehrli) in the condition of sclerotized and ribbing part of bursa copulatrix, but colliculum longer and broader, not parallel-sided, but broadened posteriorly. Easily distinguished from those of *A. tayulina* Sato by colliculum broadened anteriorly. Female genitalia of *ectogramma* and *tayulina* were shown by me (Sato, 1990: 134, figs 6–9).

Specimens examined. 2 ♀, Taiwan, Taichung Co., Anmashan 2,275 m, 10. v. 1997; 1 ♀, *ditto* 2,100 m, 9. vii. 1996, 1 ♀, 10. x. 1996 (C.-M. Fu).

Geographical range. Taiwan.

Acknowledgements

I wish to express my sincere appreciation to Mr C.-M. Fu, for giving me a good opportunity to examine lots of invaluable specimens from Taiwan, and to Dr D. Stüning, Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, for his useful information and advice. I deeply thank Dr H. Inoue, Iruma, for his critical reading of the early version of the manuscript and helpful advice. My thanks are also due to Mr K. Kudo, Tokyo, for his gift of the material for this work.

References

- Butler, A. G., 1878. Descriptions of new species of Heterocera from Japan, Part 3, Geometries. *Ann. Mag. nat. Hist.* (5) **1**: 392-419.
- Holloway, J. D., 1994. The moths of Borneo: family Geometridae, subfamily Ennominae. *Malay. Nat. J.* **47**: 1-309, pls 1-19, 593 figs.
- Inoue, H., 1953. Notes on some Japanese Larentiinae and Geometrinae (Lepidoptera: Geometridae). *Tinea* **1**: 1-18, pl. 1.
- , 1968. On the genus *Cleora* of Japan (Lepidoptera: Geometridae). *Tinea* **7**: 158-166, pls 30-33.
- Leech, J. H., 1897. On Lepidoptera Heterocera from China, Japan, and Corea. *Ann. Mag. nat. Hist.* (6) **19**: 297-349, 414-463.
- Prout, L. B., 1915. Geometridae. In Seitz, A. (Ed.), *Gross-Schmetterlinge der Erde* **4**. Stuttgart.
- Sato, R., 1984. Taxonomic study of the genus *Hypomecis* Hübner and its allied genera from Japan (Lepidoptera: Geometridae: Ennominae). *Spec. Bull. Essa ent. Soc.* **1**: 1-213, pls 1-91 (in Japanese).
- , 1990. One new species and one unrecorded species of *Alcis* (Geometridae) from Taiwan. *Japan Heterocerists' J.* (158): 133-135 (in Japanese).
- , 1999. Notes on some species of the Boarmiini (Geometridae, Ennominae) from Taiwan with description of one new species. *Tinea* **16**: 29-40.
- Shin, Y. H., 1983. Geometridae. In Shin, Y. H. et al., *Illustrated Flora and Fauna of Korea* **27** (Insecta): 168-272, 760-821, 994-1002, pls 1-14.
- Wehrli, E., 1943. Geometridae. In Seitz, A. (Ed.), *Gross-Schmetterlinge der Erde* **4** (Suppl.). Stuttgart.

摘 要

台湾産 Boarmiini 族の 2 新種 2 新亜種と *Alcis anmashanensis* Sato ♀ の記載 (シャクガ科, エダシャク亜科) (佐藤力夫)

傅建明氏ら (台中県太平市) が鞍馬山の 2,000 m 以上の高山帯で採集された Boarmiini を調査し, 次の新種, 新亜種を認めるとともに, ♂ のみで記載された *Alcis anmashanensis* の♀を見出すことができた。

Ramobia anmashana Sato (新種)

日本の *R. basifuscaria* (Leech) ネグロエダシャク, *R. mediodivisa* Inoue ナカジロネグロエダシャクと同様, 晩秋 (11 月) に出現する。中国大陸から Wehrli (1943) によって同属と思われる *Boarmia* が 3 種記載されているが, 本種とは異なることを確認している。

Psilalcis fui Sato (新種)

近縁の *Heterarmia*, *Polymixinia*, *Protoboarmia* 3 属と *Psilalcis* 属との系統関係については, 未解決の問題があるが, 広義の *Psilalcis* の一員として記載した。種小名は採集者の傅建明氏に献名した。

Duliophyle agitata taiwana Sato ヒロオビエダシャク (新亜種)

日本の個体群に比べ、明らかに大型で前翅の白色紋は表裏ともより明瞭に表れる。♂交尾器では、harpeがより長くのび角状のcornutusも長い。現在、中国大陸の個体群は、ssp. *angustaria* (Leech) として扱われているが、Dr Stüning からの私信によると、独立種の可能性があるという。

Cleora leucophaea taiwanensis Sato シロテンエダシャク (新亜種)

個体変異のよく見られる種であるが、日本各地の個体群と比較した結果、特に交尾器に安定した差異があるので、台湾の山地に隔離された亜種として記載した。日本の個体群に比べ、一般に淡色で前翅がやや細い。日本の個体群には、通常の個体のほかに、前後翅の中央に黒線が明瞭に発達する型 (*nigrofasciaria*-form) と、前翅が黄色味を帯びる型 (*yellow*-form) が知られているが、本亜種では今のところ前者のみ確認されている。♂交尾器では、harpeが側面の三角状突起をはるかに超えて伸展し、刺状の突起もよく発達する。♀交尾器では、sterigmaの中央が大きく凹み、側方へ幅広く長く伸びる。

Alcis anmashanensis Sato

鞍馬山 (alt. 2,350 m) で得られた1♂に基づいて記載 (Sato, 1999) された種で、今回、同地で初めて4♀が得られたので、♀の記載をおこなった。

(Accepted February 15, 2002)